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ABSTRACT

The development of a counseling system designed for a small computer, although limited in both scope and objectives, appears to be practicable and economical. Described herein is a program intended to perform some of the functions performed by a counselor. It is merely a tool to be used by counselor, not a replacement for him. The program described applies to vocational counseling. Keeping data current is simplified by using a computer. The main object of such a program is to promote the decision making ability of the student by making information available to him, and by giving him the opportunity for vicarious experiences in making occupational choices. A total of three precise tasks in the design of this exploration system are indicated: (1) the development of interest categories; (2) the development of categories of educational aspirations; and (3) the classification of a given set of occupations in terms of the specified interest and educational categories. The system may then be used by students or counselors in any of three modes: (1) exploration, (2) index, or (3) guidance. This program has been implemented on a DEC TSS-8 system, for reasons described in another paper. It is being used in the Faculty of Education, The University of Calgary. (KJ)

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A COMPUTER ASSISTED VOCATIONAL COUNSELING SYSTEM

by

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1. INTRODUCTION

Numerous computer systems for educational and vocational counseling have been described in recent years. Probably the first was that developed by Cogswell et al. (1965) at the Systems Development Corporation. Others have been reported by Loughary et al. (1966), Tondow and Betts (1967), Tiedemann (1968), and Super (1969). With very few exceptions (e.g. the Follett system), projects such as these have depended upon the use of a time-shared computer. It has been assumed that the student would sit at a computer terminal and receive counseling by holding a conversation with the computer program.

Such programs have gradually been approaching the level of an economic tool for the counselor. With the appearance of time-shared computers of size and cost which make them more readily available for use in schools, it seemed reasonable to attempt the implementation of a vocational counseling system on one such machine. This paper, therefore, describes the development, for a small computer, of a counseling system which, although presently limited in both scope and objectives, appears practicable and economic.

The system is being implemented on a DEC TSS-8 computer in the Faculty of Education at The University of Calgary. It could be adapted to any comparable machine. Similarly, the counseling procedure is of general applicability. Since the objective is to realize a practical and useful tool, the vocational counseling data are related to a specific locality: they are the data used by the Calgary Public School Board. Again, however, the data may readily be modified for use in another locality.

2. PRINCIPLES

From one point of view, the program is a simulation of part of the behavior of a vocational counselor. It is intended to perform some of the functions ordinarily performed by a counselor, and must therefore conform to desirable counseling procedures.

However, the aim is not to replace the counselor: it is simply to provide him with a new tool, both reliable and economic, which he may use in order to employ his own time to greater effect. He may wish to operate the terminal personally, in order to use the system as an information retrieval device. Alternatively, he may wish to have a student sit at the terminal to receive counseling from the system instead of from a human counselor. It is therefore desirable that computer terminal time should be less expensive than counselor time.

From the student's viewpoint, it is important that the program should provide all that the counselor would ordinarily provide in the early stages of vocational counseling. However, it should be more readily accessible than the counselor, and for a longer period of time. This may, indeed, be claimed as one of the principal advantages of a computer-based system.

A further consideration is that any vocational counseling system should be so designed that it readily allows revision of its data base. Conditions of employment, wages and salaries, entry requirements, etc. are changing rapidly. Information of this kind forms the data base of a vocational counseling system and has to be constantly updated. Such updating should be easier in a computerized rather than in a non-computerized system.

3. VOCATIONAL EXPLORATION

The provision of vocational information for the student is a simple but important function of a counselor. It is also necessary, however, to encourage the student to explore the information provided. Such exploration is guided by questions regarding the student's interests, regarding the educational goals he sets for himself, and so on. In modern counseling practice no attempt is made to direct the student into a particular type of vocation, still less into a specific occupation. He is encouraged to discover his own interests, to set his own educational goals, to explore a number of specific occupations. The object is to promote the decision-making ability of the student by making information available to him, and by giving him opportunity for vicarious experience in the making of occupational choices.

The justification of such a procedure is firmly grounded in research evidence. It is possible to demonstrate significant group differences in measures of personality traits, attitudes, mental abilities, etc. It is also possible to obtain such measures for a sample of subjects and to demonstrate the significant correlation, or multiple correlation, with a criterion. To use the same measures for any given individual as a basis for predicting his success in a specific vocation is, however, a different matter. With few exceptions, the amount of criterion variance so accounted for will be so small as to make the procedure at best very dubious, and at worst highly misleading (Cronbach, 19 ; Vernon, 19).

In the case of vocational guidance, therefore, a simple diagnostic or prescriptive procedure cannot be justified. The primary concern is not to predict the student's degree of success in a particular vocation.

Rather, it is to inform and educate him, to help him discover his interests and set his goals, to give him experience in choosing occupations and to develop his ability to make realistic decisions.

The making of realistic decisions involves a consideration of the student's academic history and prospects. It is therefore acceptable to indicate to what academic level he must reach if he is to qualify for entry to a specific vocation, and such indication should give any necessary details of subjects and grades required. It may also be advisable to have a student consider his performance in school to date, and to help him assess the likelihood that he will be able to achieve the standard necessary for the vocation he is considering.

Essentially, however, the computer-based counseling system should be an "exploration" system. From one point of view it simulates the procedures of a good counselor and may therefore serve as a device which the counselor will use to economize his own time. From the student's point of view, it is a simulation of decision-making guided by a counselor which can be used again and again, in complete confidence and without loss of patience by any authority figure.

4. DESIGN OF A COMPUTER-BASED VOCATIONAL EXPLORATION SYSTEM

It therefore appeared that the primary requirement of a vocational exploration system was that it should provide facilities whereby the student could make his own decisions. Such decisions would be guided by his own choices of interest area and of educational aspiration..

This indicated three precise tasks in the design of the exploration system. First, the development of interest categories; second, the development of categories of educational aspirations; and third, the

classification of a given set of occupations in terms of the specified interest and educational categories.

(a) Development of the Interest Categories

The first stage in the development of the interest categories entailed a review of the content and classification systems of the more popular interest inventories (i.e. Strong, Lee-Thorpe, Kuder, Safran, etc.). The object was to evolve categories broad enough to allow a student to make a ready choice, yet sufficiently precise to accommodate without ambiguity a student already familiar with one of the published inventories. Further, the categories had to be defined in plain language so that they could be understood by all high school student users and, insofar as possible, the definitions had to be such as to exclude the possibility of overlapping categories.

The interest categories finally decided upon are shown on the first slide.

Slide 1

(b) Development of the Categories of Educational and Training Aspirations

Categories of educational and training aspirations are defined by existing and well-recognized channels of career development. High school programs are classified as matriculation, business, vocational or general. Beyond high school level, a student commonly follows a well defined route in terms of taking an apprenticeship or attending a technical institute, a college or a university.

The chosen categories are therefore self-explanatory, and are as shown on the second slide.

Slide 2

The above categories are ordered, in a general sense, from that requiring the least amount of formal training to that requiring the most. The choice of category is therefore indicative of the degree of commitment to education and training that the student wishes to make.

(c) Classification of Vocational Materials

When developing a data base of vocational materials for use in the system it was important, as already indicated, to ensure local relevance. Lists of job titles appearing in published inventories were examined. They gave excellent coverage, but were found to contain information regarding numbers of jobs not available in the Calgary area (e.g. lighthouse keeper). It was therefore decided to make use of data provided by the Career Information Services of the Guidance Department of the Calgary School Board.* Detailed comparisons showed that the published inventories included virtually no job titles with local relevance which were not already listed in the School Board data.

Approximately 228 job titles so obtained were classified into the interest categories listed above. Each job description was then examined

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*Acknowledgements are due to the Calgary School Board and in particular, to Mr. G. French, for permission to use the data in Career Trends, 1969, published by the Calgary School Board.

to determine the minimum educational or training level required, and on this basis the job title was allocated to one of the education and training levels.

Lists were then made of all job titles within each interest/educational category. For example, within the category Economic - Clerical-Computational/High School Diploma there were 12 job titles. Some categories were, of course, empty. A sample listing of jobs within one category is given on the next slide.

Slide 3

In all there were 77 Interest/Educational categories, with a maximum of 31 job titles in any one category.

5. STUDENT AND COUNSELOR USE OF THE SYSTEM

The system may be used, by a student or by a counselor, in any one of three modes. When the terminal has been brought into operation the user is immediately informed that he may at any time type QUIT to terminate the session, or RETURN to go back to the start. The different modes of operation are then explained and he is asked to choose one.

The subsequent procedure in each of the three modes is described below:

(a) Exploration Mode

The mode most commonly used by the student will probably be the exploration mode. When the user asks for this mode, the terminal immediately presents him with a list of interest areas, from which he must choose one. When his choice is made, by typing in the appropriate

number, he is presented with a list of educational and training levels, from which he is required to choose the one to which he aspires. Again, he may reply simply by typing in a number. He is then presented with a list of appropriate job titles, headed by his chosen interest title and aspired educational and training level. Each job title is followed by an appropriate code number. Upon typing in a code number he is presented with a brief description of the job, special educational qualifications required, length of training, employment opportunities, wages, etc. He may use the code number to obtain more detailed information from the vocational counselor.

The system then asks the student whether he wishes to quit, or return to the same list of job titles, or return to the beginning of the exploration mode, or return to choose another mode.

(b) Index Mode

The index mode will probably be most used by the counselor himself, but may be used by the student if he so desires. As suggested by the name, this mode simply provides an index to all job titles so that they may be accessed directly. The terminal first presents a summary index. From this the user may obtain the alphabetic section of the index including the job title in which he has a special interest. Each job title is followed by a code number, and upon typing in the code number he may obtain the job summary already described. At any point he may quit, or return to choose another mode of operation, or return to the summary index in order to choose another alphabetic section.

(c) Guidance Mode

The first and second modes of the system have been fully designed and are now being made operational. The guidance mode, however, is still in the design stages and it is here that we should appreciate comments from experienced counselors.

The intention at the present time is to create for each student a file giving his recent educational history and high school route. This will be matched with the educational requirements of his chosen vocation. The question is, how do we bring any necessary realism to bear on his choice without, at the same time, discouraging him or placing an unjustifiable limit on his aspirations?

At the present time, the solution is simply to output comments such as:

> This job requires a university education. For university entry you will need senior matriculation. At present you are in the vocational group. Please discuss this matter with your counselor.

6. HARDWARE AND SOFTWARE

In order to meet the requirements of practicality and economy it was decided to implement the vocational counseling system, as already indicated, on a DEC TSS-8 system. The system has already been described in a previous paper and reasons have been given for the choice.

With regard to terminals, the present decision is to use teletypes and the computer-controlled random-access slide projector which has also been described.

The system is being written using subroutines developed in assembler language. The lists of interests and educational aspirations will each require one slide. The lists of job titles for mode 1 will require a further 56 slides and the index for mode 2 will require 8 slides. This leaves 16 slides for instructions and later expansion of the system.

The summary data for jobs will be stored on DEC tape and estimates indicate that all such data can be stored on one tape. A second tape will be required for student files.

7. FUTURE DEVELOPMENTS

All indications suggest that, as described, the system will meet the specified requirements, and that it will be practical and reasonably economic to use. However, it could be made even more economic by the introduction of visual display terminals with local storage. And it could be made more useful to the student by the introduction of T.V. displays for both the presentation of information and the graphic description of jobs. The intention is to introduce these and other improvements into the system within the near future. The present program obviously represents no more than the beginning of the vocational counseling system which could be developed.

Slide 1

INTEREST TITLES

Economic: Interested in work related to the business world. As this area is very large this system divides Economic Interest into two sub-titles: economic - clerical-computational and economic - sales-distributive.

#1 - ECONOMIC - CLERICAL-COMPUTATIONAL: Interested in office work which requires precision and accuracy; likes working with numbers.

#2 - ECONOMIC - SALES-DISTRIBUTIVE: Interested in promoting projects or things to sell; likes to meet and deal with people.

#3 - OUTDOOR: Interested in nature; likes outdoor activities.

#4 - PROFESSIONAL SERVICE: Interested in providing a personal service to others based upon highly specialized skills.

#5 - SCIENTIFIC (THEORETICAL-RESEARCH): Interested in seeking explanations for events; likes to conduct experiments and discover facts.

#6 - TECHNICAL (APPLIED-SCIENTIFIC): Interested in mechanical processes; likes to work with machines and tools.

#7 - SERVICE OCCUPATIONS: Interested in performing duties to meet the immediate needs of individuals or the community; likes to work for the benefit of others.

Creative Arts: Interested in activities which allow expression of creativity, imagination and sensitivity to beauty; likes to participate in activities for which he/she has special talents; likes to stimulate imagination and move the feelings of others. This area has been divided into four sub-titles as follows:

#8 - ART: Interested in activities that involve design, color and materials.

#9 - MUSIC: Interested in playing musical instruments, singing, conducting, writing musical compositions or listening to music.

#10 - DRAMA: Interested in acting or performing for an audience.

#11 - LITERARY: Interested in reading and writing.

Slide 2

ASPIRED EDUCATION/TRAINING LEVEL

1. LESS THAN HIGH SCHOOL DIPLOMA

2. APPRENTICESHIP

3. HIGH SCHOOL DIPLOMA (VOCATIONAL, BUSINESS, GENERAL)

4. SENIOR MATRICULATION

5. TECHNICAL INSTITUTE

6. COLLEGE

7. UNIVERSITY

Slide 3

#1 ECONOMIC - CLERICAL-COMPUTATIONAL

3. HIGH SCHOOL DIPLOMA (VOCATIONAL, BUSINESS, GENERAL)

Accounting Clerk 106
Banking 114
Bookkeeping Machine Operator 108
Comptometer Calculating Machine Operator 107
Computer Console Operator 116a
Data Control Clerk 116b
General Clerk 105
Industrial and Cost Accountant RIA 117
Keypunch Operator 116
Library Aide - School Aide 120b
Stenographer Secretary 112
Typist 111